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PATENT

WHAT IS CLAIMED IS:

1. A method comprising:

- a) providing functionalized carbon nanotubes, wherein the functionalized carbon nanotubes are aryl halide functionalized carbon nanotubes comprising aryl halide species on the sidewall of the carbon nanotubes;
- b) dispersing said aryl halide functionalized carbon nanotubes in a solvent;
- c) adding to the solvent at least one of: (i) an alkylolithium species, wherein the alkylolithium species reacts with the aryl halide functionalized carbon nanotubes and (ii) a metal, wherein the metal reacts with the aryl halide functionalized carbon nanotubes and replaces aryl-halide bonds with aryl-metal bonds, wherein said reaction with the aryl halide functionalized carbon nanotubes forms initiator groups for anionic or ring opening polymerization;
- d) adding a monomer to the solvent; and
- e) initiating anionic or ring opening polymerization utilizing the monomer and the initiator groups of the functionalized carbon nanotubes to form a polymer-carbon nanotube material.

2. A method comprising:

- a) providing aryl halide functionalized carbon nanotubes;
- b) dispersing said aryl halide functionalized carbon nanotubes in a solvent;
- c) adding an alkylolithium species to the solvent, wherein the alkylolithium species reacts with the aryl halide functionalized carbon nanotubes;
- d) adding a monomer to the solvent; and
- e) initiating anionic or ring opening polymerization utilizing the monomer and the functionalized carbon nanotubes to form a polymer-carbon nanotube material.

3. A method comprising:
 - a) providing aryl halide functionalized carbon nanotubes;
 - b) dispersing the aryl halide functionalized carbon nanotubes in a solvent;
 - c) adding a metal to the solvent, wherein the metal reacts with the aryl halide functionalized carbon nanotubes and replaces aryl-halide bonds with aryl-metal bonds;
 - d) adding a monomer to the solvent; and
 - e) initiating anionic or ring opening polymerization utilizing the monomer and the functionalized carbon nanotubes to form a polymer-carbon nanotube material.
4. The method of Claim 3, wherein the metal comprises a substance selected from the group consisting of include zinc, nickel, potassium, sodium, lithium, magnesium, cesium, palladium, and combinations thereof.
5. The method of Claim 3, wherein the metal is Mg, which reaction with the aryl halide functionalized carbon nanotubes comprises formation of a Grignard species.
6. The method of Claims 1-4 or 5, wherein the carbon nanotubes have the aryl halides bonded to the sidewall of the carbon nanotubes.
7. The methods of Claims 1-4 or 5, wherein the aryl halide comprises a halide selected from the group consisting of chlorine, bromine, iodine, and combinations thereof.
8. The methods of Claims 1-4 or 5, wherein the aryl halide is aryl bromide.
9. The methods of Claims 1-4, or 5, wherein the alkylithium species is n-butyllithium.
10. A method comprising:
 - a) providing functionalized carbon nanotubes, wherein the species functionalized on the carbon nanotubes comprise at least one initiation site operable for anionic or ring opening polymerization, and wherein the

specie functionalized on the carbon nanotubes are functionalized on the sidewalls of the carbon nanotubes;

- b) dispersing the functionalized carbon nanotubes in a solvent;
- c) adding a deprotonating agent to the solvent, wherein the deprotonating agent deprotonate the nucleation sites of the functionalized carbon nanotubes and form initiator groups for the anionic or ring opening polymerization;
- d) adding a monomer to the solvent; and
- e) initiating anionic or ring opening polymerization utilizing the monomer and the functionalized carbon nanotubes to form a polymer-carbon nanotube material.

11. The method of Claim 10, wherein the nucleation sites of the functionalized carbon nanotubes are at least one of the elements selected from group consisting of carbon, sulfur, oxygen, and nitrogen.

12. The method of Claim 10, wherein the functionalized carbon nanotubes are selected from the group consisting of phenol functionalized carbon nanotubes, thiophenol functionalized carbon nanotubes, phenethyl alcohol functionalized nanotubes (CNT-C₆H₄-CH₂CH₂OH), CNT-C₆H₄-NHBoc, and combinations thereof.

13. (Cancelled).

14. The method of Claims 10-11 or 12, wherein the deprotonating agent comprises a base.

15. The method of Claim 14, wherein the base is selected from the group consisting of KOH, KH, NaOH, NaH, and potassium hexamethyldisilazide.

16. The method of Claims 10-11 or 12, wherein the deprotonating agent comprises a metal operable for deprotonating the nucleation sites.